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ABSTRACT

Two perennial problems confront nonprofit institutions. These are the pricing of services and the measuring of service effort or service productivity in objective and qualitative terms. Colleges and universities can obviously not be exempt from these problems. In this paper, the suggestion is posed that tuition pricing must be rationalized and empiricized in the university model. Hence, the attempt is to relate the instructional service character of the university to the tuition pricing structure of the school. The inadequate fit of the business model for the university has been obvious to many commentators for a long time. But principles of efficiency and effectiveness can be developed and refined for the institutions of higher learning. It is hoped that this suggestion proves to have merit. (Author/HS)

THE UNIVERSITY OF SAN FRANCISCO

Office of Institutional Studies

TUITION PRICING: AN INSTRUCTIONAL FACTORS MATRIX APPROACH

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Two perennial problems confront non-profit institutions. These are the pricing of services and the measuring of service effort or service productivity in objective and qualitative terms. Hospitals and museums, symphony orchestra associations and social service agencies, churches at the parish and diocesan levels of organization have these problems. Regardless of levels, schools have these same problems.

In American higher education, be the institutions public or private in sponsorship, a single practical solution to tuition pricing is found. That solution is some variant form called here "global tuition pricing." Having determined by institutional policy an arbitrary proposition of total university expenditures to be covered by tuition and fees, the tuition and fee schedule is adjusted to cover that estimated dollar amount. Generally, credit-unit costing is the well known accounting practice used in this process.[1]

But more systematic and objective approaches are

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possible now. Handles to this problem can be found in Miller's early 1960's survey on state budgeting formulas. Especially the California staffing formula experience could be useful.[2] Bowen and Douglass' work in comparative cost analysis of six curricular formats for the smaller liberal arts colleges would be instructive inasmuch as curriculum and instructional variables are taken into account.[3] And certainly the more recent movement to design and use large and small mathematical models for decision-making in American higher education have a role, though it be clouded at the moment.[4]

Conceiving the university holistically, the approach suggested here is one that combines the concerns for levels of difficulty and complexity in the disciplines with that of the variability in instructional format, the later being directly related to specific instructional goals, behaviorally defined. Integrating these two elements through a practical and single mathematical approach provides a potential vehicle for systematic tuition pricing. With further factors such as the amount of instructional time and the number of students serviced, the possibility of developing objective standards for determining instructional effort or "workload" is opened. However, this paper is solely concerned with tuition pricing. A succeeding paper will treat the topic of reliable calculations for instructional effort.

INSTRUCTIONAL FACTORS MATRIX:

The university is organized by disciplinary and occupational curricula. But within this organizational and curricular differentiation, there are two well recognized dimensions that are linear and hierarchical in character. The one dimension is course level. This codifies professional faculty consensus as to the ranking of any given set of

courses within disciplines in terms of levels of difficulty and complexity. The use of course numbers and the system of prerequisites determine the objective serial placement courses in the curriculum by discipline and occupational category. Hence lower and upper division course numbers in baccalaureate programs and the numerical coding of introductory, intermediate and advance courses in graduate/professional curricula provide objectively ranked categories for all courses in the university curriculum.

The second dimension contains the whole range of instructional formats which cover the comprehensive set of possible curricular goals, as given in the several taxonomies of educational objectives and Havighurst's work on developmental tasks.[5] This dimension is ordered in a linear and hierarchical fashion in terms of the amount of opportunity for students to have direct personal instructional contact with the professor. This total set of instructional formats is ordered as follows: (1) the lecture; (2) the discussion group; (3) the seminar or tutorial; (4) independent study; (5) the laboratory/demonstration/activity class; (6) the internship. These are intended to be used as generic terms for instructional formats and thus to specify a class of course formats in terms of given instructional goals. The order of these instructional formats is such that the lecture presents the lowest opportunity for direct teacher/student contact. The upper end of the continuum, the internship presents the most intensive instructional relationship, that is, one teacher to one student. See Chart No. 1 which attaches general instructional goals to each instructional format along with class size estimates. Any given course could be an instructional mix of formats, such as the lecture/laboratory pattern in the sciences, the seminar/internship set for professional education of teachers, administrators and doctors, or the

workshop structure which varies the use of the lecture/discussion group/laboratory combination in the training of educational, business and hospital administrators in computer simulation decision-making.

A cross classification of these two university dimensions yields a 5 x 6 matrix of 30 cells. Each cell represents, as it were, a given class of courses. See Chart No. 2 for this matrix of 30 cells.

From the lowest to the highest category for each dimension, ascending one-tenth weights are assigned beginning with 1.0 for the lowest category. See Chart No. 2. A cross-multiplication of these weights provides a combines factor for each cell. It is from this matrix of weighted factors that the tuition pricing formula is to be derived.

The detailed character of the California State Colleges faculty staffing formula is too complicated to make a comparability test across the board in terms of the weights suggested here. However, the K-factors for the activity, laboratory sciences and home economics - industrial arts laboratory is comparable with the instructional factors matrix weights of similar character. The mean K-factor for the California State College formula is 1.6 and the mean weighted factor for the matrix suggested here is 1.68 (this including the doctoral level of instruction). Likewise, the lecture courses are weighted the same. My suspicions are that empirical comparison of the state college course combination of instructional formats probably would range within the weighted factors on the matrix's instructional format continuum.

TUITION PRICING APPROACH:

The general practice in business and industry is to segment and differentially price services and wares. Higher education can do the same though it hasn't in the past. The instructional factors matrix segments the students' market of university courses for any given institution by course level and instructional format. And all agree that instructional costs rise by level of course and by the degree of personalization per instructional format. Neither of these cost factors are accounted for by globally determined fees.

The tuition pricing approach taken here is that the mean factor weight per each course level would provide a relatively cost-sensitive index. And in the practical order of things, no single course is ever taught on a single format basis, for lectures, question sessions, discussions, individual student advising and other instructional activities are part of the daily fare of the professor. In the last column of Chart No. 2 are found the mean factor weights per course level. Given a basic dollar value per unit of instruction for the lower division level, the entire set of unit tuition rate per level can be extrapolated by mathematical proportion. Permit the following illustrations and discussion of their consequences.

TUITION USES OF THE INSTRUCTIONAL FACTORS INDEX:

There are two tuition pricing uses for the instructional factors index suggested, though I suspect that fertile minds could invent many more. These uses are: (1) gross segmentation of the university curriculum by course levels and weighting these both by level and instructional format factors; (2) course level tuition costing directly relating course level and instructional format.

The first application of the weighted factors to tuition pricing is suggested by Charts Nos. 3-4. Given the current curricular stage of most American colleges and universities, the courses comprising the curriculum are not delineated sufficiently by explicit behavioral goals and related intructional formats. But the higher education curriculum is sufficiently delineated by levels of complexity and difficulty. Chart No. 2 presents the mean weights per level across all instructional formats. Using the mean weights per level and selecting a basic dollar amount for the lowest level of instruction, it is quite simple mathematically to extrapolate the unit rate per level. Chart No. 3 illustrates this process with the basic $50 lower division rate specified. Take representative data of Mythical University for one Fall semester. Chart No. 4 illustrates the increase in tuition income by such segmentation. There is little doubt that such segmentation has been done grossly in the past; and that most current tuition practice in undergraduate education is away from unit tuition pricing. However, the segmentation has not been done systematically and related to instructional format weighting. Nor does the use of this index preclude the continued flat sum approach to charging students. This instructional factors index merely suggests a more systematic and instructionally-related approach to the pricing of tuition.

The second application of the instructional factors matrix requires the university and college to be delineated sufficiently in terms of behaviorally related instructional formats. Given this, permit several examples of course-level tuition pricing in terms of the weights of the instructional factors index.

Example No. 1: English X: Composition and Gram-

mar. Lower Division. 3 semester hours credit. 3 instructional contact hours per week. 2 instructional hours of lecture (1.00). 1 instructional hour of discussion (1.10).

Calculation of Tuition: 2 x 1.00 + 1 x 1.10 = 3.10 x $50 = $155. If usual semester hours approach is used, the tuition would be 3 x $50 = $150.

Example No. 2: Chemistry B: Introductory Chemistry. Lower Division. 5 semester hours credit. 9 instructional contact hours per week. 3 instructional hours in lecture (1.00). 6 laboratory class hours (1.4).

Calculation of Tuition: 3 x 1.00 + 6 x 1.4 = 11.4 x $50 = $570. If usual semester hours approach is used, the tuition would be 5 x $50 = $250.

Example No. 3: History C: Master's Thesis Research and Writing. Graduate/Professional: Intermediate Level. 2 semester hours credit. 1/2 contact hour per week average. 1/2 instructional hours of independent study (1.69).

Calculation of Tuition: .5 x 1.69 = .85 x $65 = $55.25. Charged tuition by regular method would be 2 x $65 = $130.

The theory of this approach of tuition pricing in the application of the factors in given matrix rests upon the notion that professional service is a function of competence and time. Given the professional training of the faculty, competence is reflected through course levels and the instructional format designed for the instructional service rendered. The instructional contact hour is the time dimension. The formulation presented here as a suggestion is as follows: The summed products of the instructional contact hours (t) and the instructional factor (I) multiplied by tuition rate per level of course (R) yields tuition per course (T_c). The formula is:

$$T_c = R\ (\Sigma It).$$

The instructional factor, I, is gotten from the instructional factors matrix. Of course, this method of price tuition as-

sumed curricular designed and delineated upon the assumptions of the instructional factors matrix.

CONCLUDING REMARKS:

In this paper, the suggestion is posed that tuition pricing must be rationalized and empiricized in the university model. Hence, the attempt is to relate the instructional service character of the university to the tuition pricing structure of the school. The inadequate fit of the business model for the university has been obvious to many commentators for a long time. But principles of efficiency and effectiveness can be developed and refined for the institutions of higher learning. It is hoped that this suggestion proves to have merit.

F O O T N O T E S

[1]For example see, Clarence Scheps and E. E. Davidson, Accounting for Colleges and Universities (Rev. ed.; Baton Rouge: Louisiana State University, 1970), pp. 324-336.

[2]James L. Miller, Jr., State Budgeting for Higher Education: The Use of Formulas and Cost Analysis (Michigan Governmental Studies No. 45; Ann Arbor: The University of Michigan Institute of Public Administration, 1964).

[3]Howard R. Bowen and Gorden K. Douglass, Efficiency in Liberal Education: A Study of Comparative Instructional Costs for Different Way of Organizing Teaching-Learning in a Liberal Arts College (New York: McGraw-Hill Book Company, 1971).

[4]For recent summary and critical commentary in this area, see: James F. McNamara, "Mathematical Programming Models in Educational Planning," Review of Educational Research, Vol. XLI, No. 5 (December 1971), pp. 419-446; (2) David S.P. Hopkins, "On the Use of Large-Scale Simulation Models for University Planning," Ibid., pp. 467-478.

[5]For educational objectives basis of these instructional formats, see: (1) Benjamin S. Bloom, et al., Taxonomy of Educational Objectives: The Classification of Educational Goals -- Handbook I, Cognitive Domain (New York: Longmans, Green and Company, 1956); (2) David R. Krathwohl, et al., Taxonomy of Educational Objectives: The Classification of Educational Goals -- Handbook II, Affective Domain (New York: David McKay Company, Inc., 1964); (3) E. J. Simpson, "The Classification of Educational Objectives: Psychomotor Domain," Illinois Teachers of Home Economics, Vol. X (1966), pp. 110-144;

(4) Robert J. Havighurst, Developmental Tasks and Education (2nd ed.; New York: Longmans, Green and Company, 1952). For a summary of research in the use of the first two taxonomies, see, Benjamin S. Bloom, et al., Handbook of Formative and Summative Evaluation of Student Learning (New York: McGraw-Hill Book Company, 1971).

CHART NO. 1: INST

INSTRUCTIONAL FORMAT
LECTURE
DISCUSSION GROUP
SEMINARS (OR TUTORIALS)
INDEPENDENT STUDY
LABORATORY/ DEMONSTRATION/ ACTIVITY
INTERNSHIP

RUCTIONAL FORMATS, EDUCATIONAL GOALS AND CLASS SIZE

PRIMARY EDUCATIONAL GOALS	CLASS SIZE
COGNITIVE + AFFECTIVE ENCYCLOPAEDIC KNOWLEDGE	25+
COGNITIVE/AFFECTIVE SKILL DEVELOPMENT LINKED TO GENERAL LEVEL OF ENCYCLOPAEDIC KNOWLEDGE	15-24
HIGHER LEVEL COGNITIVE/ AFFECTIVE SKILL DEVELOPMENT LINKED TO PARTICULAR DISCIPLINE	5-14
CULTIVATION OF PARTICULAR EDUCATIONAL LEARNING THROUGH SUPERVISED PERSONAL STUDY	1
PSYCHOMOTOR SKILL DEVELOP-MENT LINKED COGNITIVE + AFFECTIVE KNOWLEDGE	EQUAL TO NUMBER OF STATIONS
SUPERVISED ON-SITE INTE-GRATION OF THEORY IN PRACTICE	1

CHART NO. 2: INSTRUCTIONAL FACTORS MATRIX

COURSE LEVELS			INSTRUCTIONAL FORMATS						MEAN
			THE LECTURE (1.0)	DISCUSSION GROUP (1.1)	THE SEMINAR (1.2)	INDEPENDENT STUDY (1.3)	LAB/DEM/ ACT CLASS (1.4)	THE INTERNSHIP (1.5)	
GRADUATE/PROFESSIONAL	DOCTORAL DEGREE LEVEL	ADVANCED (1.4)	1.40	1.54	1.68	1.82	1.96	2.10	1.75
	MASTER'S DEGREE/ FIRST PROFESSIONAL DEGREE LEVEL	INTERMEDIATE (1.3)	1.30	1.43	1.56	1.69	1.82	1.95	1.63
		INTRODUCTORY (1.2)	1.20	1.32	1.44	1.56	1.68	1.80	1.50

UNDERGRADUATE	BACCALAUREATE DEGREE LEVELS	UPPER DIVISION (1.1)	1.10	1.21	1.32	1.43	1.54	1.65	1.38
		LOWER DIVISION (1.0)	1.00	1.10	1.20	1.30	1.40	1.50	1.25

CHART NO. 3: GENERATION OF HYPOTHETICAL TUITION RATE SCHEDULE BY INSTRUCTIONAL MATRIX FACTORS

COURSE LEVEL		INSTRUCTIONAL MATRIX FACTOR	FACTOR GENERATED TUITION/UNIT (LD BASE = $50)	HYPOTHETICAL ROUNDED TUITION/UNIT
MASTER'S/FIRST PROFESSIONAL DEGREE LEVEL	INTERMEDIATE	1.63	$65.20	$65
	INTRODUCTORY	1.50	60.00	$60
BACCALAUREATE DEGREE LEVEL	UPPER DIVISION	1.38	55.20	$55
	LOWER DIVISION	1.25	50.00	$50

CHART NO. 4: MYTHICAL UNIVERSITY -- COMPARISON OF TUITION PRICING APPROACHES -- FALL 1971 DATA

ACADEMIC ORGANIZATION	CLASSES OF UNITS		IF MATRIX APPROACH		GLOBAL APPROACH	
			RATE	INCOME	RATE	INCOME
COLLEGE OF ARTS	LOWER DIV.	12,867	$50	$ 643,350	$51	$ 656,217
	UPPER DIV.	22,857	55	1,257,135	51	1,165,707
	GRAD./PROF.	327	60	19,620	51	16,677
	SUB TOTAL:	36,051		1,920,105		1,838,601
COLLEGE OF SCIENCES	LOWER DIV.	7,168	50	358,400	51	365,568
	UPPER DIV.	2,025	55	111,375	51	103,275
	GRAD./PROF.	90	60	5,400	51	4,590
	SUB TOTAL:	9,283		475,175		473,433
SCHOOL OF BUSINESS ADMINISTRATION	LOWER DIV.	1,476	50	73,800	51	75,276
	UPPER DIV.	2,818	55	154,990	51	143,718
	GRAD./PROF.	840	60	50,400	60	50,400
	SUB TOTAL:	5,134		279,190		269,394
SCHOOL OF NURSING	LOWER DIV.	957	50	47,850	51	48,807
	UPPER DIV.	1,787	55	98,285	51	91,137
	SUB TOTAL:	2,744		146,135		139,944

CHART NO. 4: CONTINUED

ACADEMIC ORGANIZATION	CLASSES OF UNITS	IF MATRIX APPROACH		GLOBAL APPROACH	
		RATE	INCOME	RATE	INCOME

SCHOOL OF LAW	GRAD./PROF.	7,846	$60	$ 470,760	$60	$ 470,760
	SUB TOTAL:	7,846		470,760		470,760
EVENING COLLEGE	LOWER DIV.	4,093	50	204,650	45	184,185
	UPPER DIV.	6,211	55	341,605	45	279,495
	SUB TOTAL:	10,304		546,255		463,680
DEPARTMENT OF EDUCATION	LOWER DIV.	106	50	5,300	51	5,406
	UPPER DIV.	2,423	55	133,265	51	123,573
	GRAD./PROF.	1,532	60	91,920	51	78,132
	SUB TOTAL:	4,061		230,485		207,111
TOTAL:	LOWER DIV.	26,667	50	$1,333,350		
	UPPER DIV.	38,121	55	2,096,655		
	GRAD./PROF.	10,635	60	638,100		
	TOTAL:	75,423		$4,068,105		$3,862,923
DIFFERENCE: COL. 1 - COL. 2	$205,182					